

Editorial

African Fisheries Social Science Research Network: A Proposed Activity

Several recent reports have emphasized the need to enhance national research capacities in fisheries and aquaculture research in Africa (Fisheries and Aquaculture Research Capabilities and Needs in Africa, World Bank Technical Paper No. 149, 1991; Fisheries Socioeconomics in the Developing World, IDRC, 1993; FAO Expert Consultation on Fisheries Research, FAO, 1994). This is especially true for fisheries social science research which is weak in Africa, relative to other regions of the world. The emphasis of fisheries research institutions in the past has been placed on biological, rather than socioeconomic research. While the relatively great demand for biological information derives in part from the need for measuring an unseen resource in order to manage it, this has tended to lead to a serious shortage of socioeconomic analysis. There is a priority need in Africa for socioeconomic information and for both individual and institutional capacity building throughout the region. Fisheries, not being particularly important to many of the countries which can invest in research, have attracted relatively little attention from academic economists and sociologists. Non-academic economists, while producing some relevant research, have tended to focus on development issues such as investment and marketing.

A similar problem to that described above for Africa existed in Southeast Asia until the early 1980s. There was weak capacity in fisheries social science research and there was no mechanism in the region to pull together economists and other social scientists for the purpose of promoting research and training in the social science aspects of fisheries. There are hundreds of mechanisms and structures which can be used to enhance social science research capabilities. A network approach was chosen for use in Southeast Asia to meet these needs. In 1983 the Asian Fisheries Social Science Research Network (AFSSRN) was established with member researchers and institutions in Indonesia, Malaysia, the Philippines, Thailand and Vietnam. The AFSSRN has played a significant role in improving the research skills, supporting research endeavors, providing opportunities to interact with and learn from other fishery social science researchers in the region, and expanding the professional pool of adequately trained researchers in fishery, aquaculture and coastal resource social science.

A similar approach is recommended for Africa. The scope and methods of activities could include networking, education and training, research support and information dissemination. It could concentrate on the economics, sociology and anthropology disciplines. The focus would be on developing institutional capacity by developing a core group of individual researchers at a particular academic institution, research institution and government fishery agency. The geographic coverage of such a network would need to be determined. It is recommended to start with a small number of institutions and add more over time. ***R.S. Pomeroy***

Economic Incentives for Water Resource Management in the Pak Phanang River Basin of Southern Thailand

PENPORN JANEKARNKIJ

Introduction

The administration of the irrigation system in the Pak Phanang River Basin (PPRB) is under the responsibility of the Regional Irrigation Office XI (RIO XI) of the Thai Royal Irrigation Department (RID). The special project, namely the Pak Phanang Operation and Maintenance Irrigation Project (PPRB), under the RIO XI is directly responsible for water resource management in the PPRB. The overall objective of the PPRB project is to provide enough fresh water for agriculture and domestic use to improve the welfare of the local people. The major task of the project includes the: draining of excess water during the the wet season; occasional dredging of irrigation canals; and the prevention of salt water from entering the agricultural production area in the dry season, thus creating a storage basin within the canal system. The total project area is 212,136 ha, including four districts: Pak Phanang, Chian Yai, Hua Sai, and Cha Uad. Of the total project area, 73% is considered to be in the beneficial area receiving benefits from storage, drainage, flood protection, and irrigation.

In the PPRB, water is held back after the wet season by the head regulators, usually at the beginning of January and providing fresh water resource to the irrigated area from April to August. Competition for fresh water always occur when the resource is limited during the dry season. In the Pak Phanang area, surface water is allocated among farmers through a government-owned pump program for off-season rice production. The primary goal of that program is to fully support farmers who have sustained crop damages of at least half of their expected production in the most recent season. For those who sustain crop damage less than the standard rule, the fuel costs must be paid for by those who benefit from the use of the pumps.

The study examines the existing water allocation methods and other policies that provide constraints or incentives for the most efficient use of water resources. Given the production conditions of the local people, and the technical and physical attributes of water resources, the principal hypothesis of this study is that the benefits obtained from fresh water resources in the study area can be improved through better resource management.

Methodology

A survey of 107 rice farmers who utilize fresh water resources for off-season rice production was undertaken in the Chian Yai district of the PPRB. The survey data are used to estimate crop production functions and to construct farm-level and community-level optimization models. The components of an empirical model include production function analysis, estimation of water supply in the study area, socioeconomic description of the study area, and the construction of objective functions and constraints that describe crop production and irrigation opportunities at the farm level and the community level (Table 1).

In summary, the farm-level optimization model depicts an individual farmer's production decision which maximizes annual net returns to water, management, and fixed assets, subject to production costs, physical production functions, minimum production requirement for home consumption, crop acreage constraint, and water supply constraint. In the community-level model, the objective is to maximize the sum of net returns to water, management, and fixed assets that accrue to farmers in the community, subject to the above constraints, at the community level. The production functions are estimated using SAS (Statistical Analysis System). The optimization problems are solved using GAMS (General Algebraic Modeling System).

Results

The current water allocation mechanism: Survey results show that, on the average, farmers produce about 85% of what they expect from main season production. If the rules for using the government-owned pumps at no charge are strictly implemented, no farmer would actually qualify for damage compensation, which allow farmers to use the pumps at no charge.

Farmers who want to increase their income from off-season rice production, but cannot participate in the government-owned pump program, use their own personal pumps for off-season rice production. The individual pump use is, in fact, not taken into account by the irrigation officials. However, this group of farmers obtains lower net revenues, with higher production costs than those who use the government-owned pumps (34 baht/rai compared with 248 baht/rai). The difference in the cost of using irrigation water is most apparent between these two groups. Farmers who use the government-owned pumps pay much less to use irrigation water than the farmers who cannot participate in the government-owned pump program: 0.0018 baht/ m³ or 4 baht/rai compared with 0.0765 baht/m³ or 102 baht/rai on the average. However, the overall operating cost pertaining to the use of the government-owned pumps, if paid by the user, is 0.0875 baht/m³. Thus, this program, which initially aims to promote farmer income distribution, can induce an unintended income discrepancy among farmers.

Table 1. Summary of the model.

Community level: $\text{Maximize } \sum_j \sum_i (nr_{ij}^m \cdot A_j^m + nr_{ij}^f \cdot A_j^f)$,

Farm level: $\text{Maximize } (nr_i^m \cdot a_i^m + nr_i^f \cdot a_i^f)$,

$$nr_i^m = p_y^m y_i^m - cost_i^m,$$
$$nr_i^f = p_y^f y_i^f - cost_i^f,$$

subject to

1. production functions:
   - *main season:* $y_i^m = y_i^m(x_i^m)$,
   - *off-season:* $y_i^f = y_i^f(x_i^f, w_i^f)$,
2. cost functions:
   - *main season:* $cost_i^m = p_v^m x_i^m + c_{ai}^m$,
   - *off-season:* $cost_i^f = p_v^f x_i^f + c_{wi}^f w_i^f + c_{ai}^f$,
3. area constraints:
   - *main season:* $\sum_i a_i^m \leq A_j^m$,
   - *off-season:* $\sum_i a_i^f \leq A_j^f$,
   - $a_i^f \leq a_i^m$,
4. socioeconomic constraint:
   - *household consumption:* $y_i^m + y_i^f \geq y_i^{min}$,
5. water resource constraints:

$$S = \rho FLOW^{ST} + RAIN^{CY} + VOL^{CY}$$
$$RAIN^{CY} = RF^{CY} \cdot A_j^f$$
$$W = S - Wmin$$
$$\sum_j \sum_i w_{ij}^f \cdot A_j^f \leq W$$

Description of the variables:

i	=	individual farmer, i=1,...,n
j	=	location, j=1,...k
m	=	main season production period
f	=	off-season production period
y	=	total production of rice crops (kg/rai)
x	=	vector of variable inputs per unit area including fertilizer (50 kg), seeds (kg), and family labor (hour)
vc	=	total operating costs of production that include fertilizer, seeds, hired labor, fuel cost, and pesticides (baht/rai)
p	=	price of rice crop (baht/kg)
c_w	=	the private cost of using irrigation water (baht/m³)
w	=	the amount of irrigation water use (m³/rai)
c_a	=	the cost of using area (baht/rai)
a	=	the acreage planted (rai)
S	=	total water supply in the study area (m³/season)
Wmin	=	minimum water requirement for non-agricultural purpose (m³/season)
ρ	=	the proportion of the flow from the Saothong Weir to the study area which is assumed fixed at 22%
$FLOW^{ST}$	=	the flow volume from the Saothong Weir which is calculated from the daily discharge rating curve of the Weir (m³)
RF^{CY}	=	the rainfall depth during the irrigation season (m)
$RAIN^{CY}$	=	the rainfall volume in the study area during the irrigation season (m³)
VOL^{CY}	=	the storage volume in the canals at the beginning of the irrigation season in the study area
W	=	net water supply available for agriculture (m³/season)

The marginal social value of water resources: The marginal social value of water at the farm level becomes positive when the amount of water available to farmers is equal to 26,451 m³ or 2,405 m³/rai on average. The mean level of water use per farm, 16,462 m³, yields the marginal social value of 0.0475 baht/m³, which is greater than the average cost paid by an individual farmer, 0.0422 baht/m³, on average. At this current cost of water, the optimal water use rate predicted by the model is 1,598 m³/rai. The model also predicts that a farmer can reduce water applications by about 30% from the mean level to obtain about the same amount of net revenue and yield per rai that is reported in the survey.

Discussion

For further improvement of water resource management in the PPRB, the following alternatives are proposed.

6.25 rai = 1 ha and US$1 = Baht 25.4 (1992).

Improvement of water storage facilities at the local level. The problem of water shortage during the dry season can be alleviated if additional volume of water could be stored during the wet season for agricultural and nonagricultural uses during the dry season. The negative relationship between crop productivity and the distance from a water source to individual farm fields suggests that the water distribution system, coupled with the management level, should be improved so that water can be distributed more equitably among farmers. As observed, the maintenance efforts for community ditches vary among villages, depending on the effectiveness of the village committee and the degree of cooperation among farmers. The high cost of new investments to increase water supply may not be worthwhile to local people if the storage facilities and the water distribution system essential for local use of water are not improved.

Creating economic incentives for water users. The effective use of water charges as a means to improve water management depends on many considerations. Volumetric pricing is an ideal approach to pricing irrigation water when the amount paid for water affects decisions regarding water use. If farmers have no control over the volume or timing of water received, charging for water volumetrically would have no influence on their water use decisions. Implementation cost is another concern for using volumetric pricing. In the study area, the amount of water can be measured by the length of time that the water is received. However, when a large number of farmers are involved, it is difficult to deliver water according to an individual farmer's demand. A share of the flow or quota can be another alternative for volume. Charges can be implemented at the tertiary unit where the amount of water can be approximated and a small group of farmers share the water cost at each unit.

The marginal value of water is time and location specific, and it depends on the amount of water available and the marginal productivity of water to the community. Although the marginal social value of water is considered as the true price of water, irrigation fees at this price may be too high and farmers may be left with less income than they would have had in the absence of irrigation water. In setting irrigation charges, it may be more practical in the study area if fees are set to recover the marginal cost of irrigation services rather than the true marginal value of water.

Enhancing the role of water organizations and institutions. The establishment of a water user organization is strongly encouraged and participation in the organization should be promoted. Farmers have detailed knowledge of local streamflow, soil conditions, and property rights, and this knowledge is essential in planning the water allocation scheme. While implementing water prices through the market system or through a government agency may not be feasible politically or institutionally, the system can be implemented by water user organizations. Farm-level participation in the organizations could include farmers' input in selecting the methods of water pricing and cost recovery.

Alternative water allocation mechanism. The above approaches can be combined and applied as an alternative approach to water management in the PPRB. The analysis shows that farmers who use a government-owned pump can pay for the overall operating cost, even if it will reduce their net revenues. Payment for the use of the government-owned pump can be considered as the cost of lease. This payment can be set to recover the operating cost of using the pump. Farmers who are willing to use the government-owned pump should form the group. Flexibility of money collection and responsibility for the agreement to share the cost and the use of water should be given to the user group. It is suggested that a water charge is preferable to other types of fees which can be paid in cash or in kind. When a charge is paid in kind, the payment system can be combined with the Rice Grain Banking Project implemented in the area by the irrigation extension officials. Hence, the local group-based management of irrigation water can be established.

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AFSSRNewsbits

Team Leaders' Meeting in Beijing

The AFSSRN held a team leaders' meeting in Beijing, China on 18 October in conjunction with the Asian Fisheries Forum. Among the items taken up were: the future of the Network, publication of upcoming report series, regional and national workshops, and various research grants. The discussion mainly focused on the official ending of IDRC support to the Network on 31 March 1996 after 13 years of assistance. Future prospects and possible funding by other donors were also discussed.

Special session at AFF

A special AFFSRN session was held during the Asian Fisheries Forum in Beijing, China on 16-20 October. Eleven network-members from various academic and research institutions from Thailand, Malaysia, Indonesia, Philippines and Vietnam participated in this activity. A total of twelve research papers were presented in the session.

Network members pose with Dr. Robert Pomeroy, AFSSRN Coordinator, during the Team Leaders' Meeting in Beijing.